IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First-Named Inventor: Johannes De Wilde	Docket No.: NL04 1251 US1
Application No.: 10/596,644 Conf.: 8785	Art Unit: 2829
Date Filed: 06/20/2006	Examiner: HOLLINGTON, Jermele M.

Title: HIGH SENSITIVITY MAGNETIC BUILT-IN CURRENT SENSOR

PETITION TO WITHDRAW ABANDONMENT UNDER MPEP SECTION 711.03(b)

SUBMISSION OF SUPPLEMENTAL PAPERS

Sir:

Applicant hereby encloses supplemental papers in support of Petition to Withdraw holding of Abandonment filed with the Office on June 4, 2008. These papers include the as-filed response and Electronic Fee Worksheet and EFS Acknowledgement.

The Commissioner is hereby requested and authorized pursuant to 37 CFR §1.136(a)(3), to treat any concurrent or future reply in this application requiring a petition for extension of time for its timely submission, as incorporating a petition for extension of time for the appropriate length of time. Please charge any additional fees which may now or in the future be required in this application, including extension of time fees, but excluding the issue fee unless explicitly requested to do so, and credit any overpayment, to Deposit Account No. 50-4019.

Date: 05-SEP-2008

Respectfully submitted,

By /Peter Zawilski/

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Appl. No.	:	10/596,644	Confirmation No.	8785
First Inventor	:	Johanness De Wilde		
Filed	:	June 20, 2006		
TC/A.U.	:	2829		
Examiner	:	HOLLINGTON, Jermele M.		
Docket No.	:	**NL04 1251 US1**		
Customer No.	:	65913		

Title: High Sensitivity Magnetic Built-In Current Sensor

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE & AMENDMENT

Sir:

In response to the Office Action of January 7, 2007, please consider the following. Applicant requests four-month extension of time.

Amendments to the Specification there are no amendments in this paper.

Amendments to the Claims begin on page 2 of this paper.

Remarks/Arguments begin on page 6 of this paper.

Amendments to the Claims

1. (*Original*) A semiconductor device with a conductive element and a current sensor, wherein the current sensor is a magnetic current sensing device for sensing direct, varying or alternating current flowing through the conductive element, the current sensing device being integrated in the semiconductor device and being galvanically isolated from the conductive element.

2. (*Original*) A semiconductor device according to claim 1, suitable for measuring current with a μA resolution.

3. (*Previously Presented*) A semiconductor device according to claim 1, wherein the current sensing device comprises at least one TMR device.

4. (*Original*) A semiconductor device according to claim 3, wherein the current sensing device shares an MTJ stack with an MRAM device.

5. (*Original*) A semiconductor device according to claim 4, wherein the MTJ stack comprises:

- an electrically insulating material (103) designed to form a magneto-resistive tunnelling barrier,

- a pinned magnetic region (105) positioned on one side of the electrically insulating material (103), the pinned magnetic region(105) having a magnetic moment vector adjacent the electrically insulating material (103),

- a nearly balanced free magnetic region (220) positioned on an opposite side of the electrically insulating material (103), the free magnetic region (220) having a magnetic moment vector (222) adjacent the insulating material (103) and oriented in a position parallel or anti-parallel to the magnetic moment vector of the pinned magnetic region (105), the free magnetic region (220) including an artificial anti-ferromagnetic layer material including N ferromagnetic layers (Fl, F2) which are antiferromagnetically coupled, where N is an integer greater than or equal to two.

6. (*Previously Presented*) A semiconductor device according to a claim 3, wherein the current sensing device has a free magnetic layer which has an easy axis oriented to be substantially perpendicular to a magnetic field caused by current under measurement.

7. (*Original*) A semiconductor device according to claim 6, the current sensing device having an easy axis, wherein the easy axis of the free layer is caused by shape elongation.

8. (*Previously Presented*) A semiconductor device according to claim 3, wherein the current sensing device is subjected to an additional magnetic field that can either be direct, varying or alternating.

9. (*Previously Presented*) A semiconductor device according to claim 1, the current sensing device having a pinned magnetic layer with a magnetisation direction and a free magnetic layer having an easy axis, wherein the magnetization direction of the pinned magnetic layer is oriented at an angle, with the easy axis of the free magnetic layer, preferably between 4S0 and 135O, more preferred substantially perpendicular to the easy axis of the free magnetic layer.

10. (*Previously Presented*) A semiconductor device according to claim 1, the semiconductor device comprising adjacent a first side of the current sensing device (210) a first conductor (90) for conveying a current (I,) to be measured and adjacent a second side of the current sensing device (210) a second conductor (91) for conducting current (I_2), the first conductor (90) and the second conductor (91) crossing but not being electrically connected.

11. (*Original*) A semiconductor device according to claim 10, the free magnetic layer of the current sensing device (210) having an easy axis, wherein the first conductor and the second conductor each include an angle of substantially between 30° and 90° with respect to the easy axis of the current sensing device.

12. (*Original*) A semiconductor device according to claim 10, furthermore comprising a feedback circuit (80) for measuring MR changes on the current sensing device (210)

and for controlling current (12) in the second conductor (91) in such a way that no MR change is observed on the current sensing device (210).

13. (*Original*) A semiconductor device according to claim 12, wherein the current feedback circuit has means for generating a feedback signal indicative of the current (I,) to be measured and conveyed by the first conductor (90).

14. (*Previously Presented*) A semiconductor device according to claim 10 wherein at least one of the first conductor (90) and the second conductor (91) comprises at least one vertical conduction component and at least one horizontal conduction component, there being a corner between the vertical conduction component and the horizontal conduction component, thus forming a conductor structure which at least includes an L-shaped part of which the corner is located adjacent the current sensing device.

15. (*Previously Presented*) A semiconductor device according to claim 1, furthermore comprising a flux concentrator (50; 70) to increase the magnetic field at the location of the current sensing device (210).

16. (*Original*) A semiconductor device according to claim 15, wherein the flux-concentrator (50; 70) comprises a dummy MTJ stack which is patterned around at least one vertical conduction component.

17. (*Original*) A semiconductor device according to claim 15, wherein the flux-concentrator (50; 70) is ring-shaped and comprises a gap (51) between poles, the current sensing device (210) being located in the gap (51).

18. (*Previously Presented*) A semiconductor device according to claim 1, wherein the sensor device is compatible with CMOS or MOS processing.

19. (*Previously Presented*) A semiconductor device according to.claim 1, wherein the semiconductor device is an integrated circuit.

20. (*Original*) A semiconductor device according to claim 19, wherein the current sensor or sensors are arranged to sense quiescent currents (IDDQ) or transient currents (IDDT).

Claims 21-22 (*Cancelled*)

Claims 23-28 (*Cancelled*)

29. (*Cancelled*)

30. (*Previously Presented*) A method for manufacturing a semiconductor device according claim 3, the method comprising providing an MTJ stack.

31. (*Original*) A method according to claim 30, wherein providing the MTJ stack comprises depositing a free region.

32. (*Original*) A method according to claim 31, wherein depositing a free region comprises depositing an artificial anti-ferromagnetic free region comprising a plurality of anti-ferromagnetically coupled ferromagnetic layers.

33. (*Original*) A method according to claim 32, the artificial anti-ferromagnetic free region having a net magnetic moment which is substantially zero, the method furthermore comprising modifying the net magnetic moment of the free region so as to make it nonzero.

REMARKS/ARGUMENTS

In response to Examiner's call for restriction, Applicant elects Group I, claims 1-20 and claims 30-33.

Please cancel claims 21-29 without prejudice.

Please charge any fees other than the issue fee and credit any overpayments to Deposit Account 50-4019.

Respectfully submitted,

Date: May 9, 2008

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Electronic Patent Application Fee Transmittal

Application Number:	10596644
Filing Date:	20-Jun-2006
Title of Invention:	High sensitivity magnetic built-in current sensor
First Named Inventor/Applicant Name:	Johannes De Wilde
Filer:	Peter Zawilski
Attorney Docket Number:	NL04 1251 US1

Filed as Large Entity

U.S. National Stage under 35 USC 371 Filing Fees

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 4 months with $0 paid	1254	1	1640	1640

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
			Total in USD ($)	**1640**

Electronic Acknowledgement Receipt

EFS ID:	3278336
Application Number:	10596644
International Application Number:	
Confirmation Number:	8785
Title of Invention:	High sensitivity magnetic built-in current sensor
First Named Inventor/Applicant Name:	Johannes De Wilde
Customer Number:	65913
Filer:	Peter Zawilski
Filer Authorized By:	
Attorney Docket Number:	NL04 1251 US1
Receipt Date:	09-MAY-2008
Filing Date:	20-JUN-2006
Time Stamp:	09:49:18
Application Type:	U.S. National Stage under 35 USC 371

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$1640
RAM confirmation Number	4826
Deposit Account	504019
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

Charge any Additional Fees required under 37 C.F.R. Section 1.21 (Miscellaneous fees and charges)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes) /Message Digest	Multi Part /.zip	Pages (if appl.)
1		NL041251US1_RestrictionResponse_2008-MAY-09.pdf	121389 afd06678f37b8ebf05b5663d3c18b0fb72439337	yes	6

Multipart Description/PDF files in .zip description

Document Description	Start	End
Response to Election / Restriction Filed	1	1
Claims	2	5
Applicant Arguments/Remarks Made in an Amendment	6	6

Warnings:

Information:

2	Fee Worksheet (PTO-06)	fee-info.pdf	8164 594670ae0ad48d61816477b401db714bb84542af	no	2

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Information:

Total Files Size (in bytes):	129553

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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.